Bank of Canada Banque du Canada

Working Paper 2004-24 / Document de travail 2004-24

Competition in Banking: A Review of the Literature

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ISSN 1192-5434

Printed in Canada on recycled paper

104-05873/

Bank of Canada Working Paper 2004-24

June 2004

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The views expressed in this paper are those of the author.
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Contents

Acknowledgements iv
Abstract/Résumé v

1. Introduction 1

2. What is the Optimal Competitive Structure of the Banking System? 2

   2.1 Economic efficiency 3

   2.2 Financial stability 11

   2.3 Summary of the efficiency–stability debate 16

3. What Does a Competitive Banking Industry Look Like? 18

   3.1 Concentration 18

   3.2 Contestability 20

   3.3 Bank characteristics that affect contestability 23

   3.4 Summary of the concentration–contestability debate 29

4. Conclusion 29

References 31

Acknowledgements

Special thanks to Dinah Maclean, Walter Engert, Chris D'Souza, and Greg Caldwell for their thought-provoking comments. Excellent research assistance was provided by Lucy Liu. Any errors are my own.

Abstract

The author reviews the theoretical and empirical literature to examine the traditional perception that the following trade-off exists between economic efficiency and stability in the banking system: a competitive banking system is more efficient and therefore important to growth, but market power is necessary for stability in the banking system. That this trade-off exists is not clear. Market power can have positive implications for efficiency, and the potentially negative implications of competition on stability may be manageable through prudential regulation. Neither extreme (perfect competition nor monopoly) is likely ideal. Rather, it may be optimal to facilitate an environment that promotes competitive behaviour (contestability), thereby minimizing the potential costs of market power while realizing benefits from any residual that remains. It can be very difficult to assess the contestability of a banking market. Recent work suggests that the number of banks and the degree of concentration are not, in themselves, sufficient indicators of contestability. Other factors play a strong role, including regulatory policies that promote competition, a well-developed financial system, the effects of branch networks, and the effect and uptake of technological advancements.

JEL classification: G28, G21, L11, L12, L13, L16
Bank classification: Financial institutions; Financial services; Market structure and pricing

Résumé

À la lumière de la littérature théorique et empirique, l'auteure examine le paradigme traditionnel voulant qu'il existe un arbitrage entre l'efficience économique et la stabilité du système bancaire. Un système bancaire concurrentiel serait en effet plus efficient et contribuerait ainsi à la croissance, mais, pour que le système jouisse d'une certaine stabilité, les banques doivent aussi posséder un pouvoir de marché. L'existence de cette relation d'arbitrage n'est pas clairement établie. Le pouvoir de marché peut avoir des répercussions positives sur l'efficience, alors que les retombées potentiellement négatives de la concurrence sur la stabilité pourraient être contenues grâce à une réglementation prudentielle. Ni la concurrence parfaite ni le monopole ne représente vraisemblablement un idéal. La solution optimale est peut-être de promouvoir un environnement qui favorise la concurrence (ou la contestabilité du marché), afin de réduire au minimum les coûts potentiels du pouvoir de marché tout en tirant parti des avantages de tout pouvoir résiduel. Il n'est pas facile d'évaluer la contestabilité d'un marché bancaire. Des travaux récents donnent à penser que le nombre de banques et le degré de concentration ne constituent pas en eux-mêmes de bons indicateurs de la contestabilité. D'autres facteurs jouent un rôle important, notamment l'existence

de réglementations qui encouragent la concurrence et d'un système financier bien développé, les effets de la présence de réseaux de succursales, de même que l'incidence des innovations technologiques et le rythme auquel elles se répandent.

Classification JEL : G28, G21, L11, L12, L13, L16
Classification de la Banque : Institutions financières; Services financiers; Structure de marché et fixation des prix

1. Introduction

The global trend towards consolidation in the financial sector has focused the attention of policy-makers on its potential economic consequences. This can be daunting, because the range of issues is expansive and the economic literature is by no means conclusive. To appropriately address consolidation, policy-makers need to consider how it could affect their overall objective for the financial system, which is to maximize social welfare.

Although the financial system comprises financial institutions, financial markets, and infrastructure arrangements such as the clearing and settlement systems, this paper focuses on financial institutions, specifically banks.[1] To understand how the banking system can contribute to social welfare, consider the function of banks. They provide financial services necessary for enterprises and consumers to undertake their business: among other things, they provide a means to hold and exchange financial assets, they intermediate savings to productive investment through the supply of credit to businesses and consumers, and they enable risk-sharing. Efficient functioning of these activities contributes to economic growth. Indeed, the fundamental importance to growth of a well-functioning financial system generally, and of a banking sector specifically, has been established for some time in the empirical literature on growth (King and Levine 1993; Levine 1997).[2]

When a banking system does not work well, there is potential for financial instability. Banks have traditionally been considered to be more vulnerable to instability than other industries, for various reasons:

- A bank's balance sheet consists of short-term deposits on the liability side and long-term assets that can be difficult to liquidate quickly. This leaves the bank vulnerable to runs in the absence of deposit insurance or maturity-matching technologies.
- Highly leveraged firms have an incentive to engage in risky behaviour. If the gamble works, shareholders benefit; if it does not work, the lenders bear the cost. This agency problem is particularly strong for banks: banks tend to be very highly leveraged; a large share of the debt-holders are depositors who have small claims, are widely dispersed, and may not be well-informed of a bank's activities and potential risks; and the existence of deposit insurance further lessens depositors' incentives to monitor the risk-taking behaviour of the bank.

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1. Defined broadly as deposit-taking institutions.
2. Financial markets also provide many of the financial services provided by banks. There is a large literature that debates whether bank-based or market-based financial systems perform these functions better, and which system best promotes economic growth. This debate is outside the scope of this paper. What appears to be important is not the particular structure of the financial system, but how well it performs its functions. See Dolar and Meh (2002) for a review of the literature.

Not only are banks potentially more vulnerable, but instability in the banking system can also have more debilitating effects than instability in other industries. Because banks hold financial assets of consumers and producers, and are important to economic growth, bank failures can have substantial economic costs. As well, banks are connected through a variety of networks (such as the interbank markets and payments systems), and so a shock to one bank can lead to shocks to other banks (contagion). This can greatly increase the cost of a crisis. For these reasons, the stability of the financial system has long been a goal of policy-makers.

Policy-makers aim to facilitate a banking system that supports both economic efficiency and stability. How best to do this is not trivial to determine and involves two fundamental questions. First, what is the optimal competitive structure to promote efficiency and stability: perfect competition, monopoly, or something in-between? Second, what does such a banking sector look like? This paper addresses these questions through a non-technical review of the theoretical and empirical literature.

Section 2 considers the optimal competitive structure. Traditionally, the perception has been that there is a trade-off between growth and stability: a competitive system is more efficient but market power (the ability to profitably price above marginal cost) is necessary for stability. Both competition and market power, however, can have positive implications for efficiency, and prudent regulation may mitigate the potentially negative aspects of competition on stability. It appears that neither competitive extreme is ideal and that something in-between may be preferred. It may be optimal to facilitate an environment that promotes competitive behaviour (contestability), thereby minimizing the potential costs of market power while realizing benefits associated with any residual market power.

Section 3 examines what such a banking system might look like. The traditional approach has been to associate concentration with market power. But, as will be shown, this is not necessarily the case. Concentrated markets can be consistent with competitive behaviour.

2. What is the Optimal Competitive Structure of the Banking System?

There has been considerable concern about how ongoing consolidation in financial systems around the world will affect competition. Indeed, much of the recent public debate seems to assume that perfect competition in banking is ideal. This has not always been the case. For much of the last century, policy-makers focused on stability. The belief that some degree of market

power was necessary to maintain stability in the banking sector led many countries to pursue policies that, implicitly or explicitly, restricted competition.[3]

In this section, the validity of this perception is explored by examining the theoretical and empirical literature on the effects that competition and market power have on efficiency (2.1) and stability (2.2).

2.1 Economic efficiency

Banks are a service industry. They contribute to economic growth not by producing real goods, but by providing the financial means to facilitate production in other industries. An efficient banking sector will make the largest contribution to economic growth. The effects of a competitive banking system versus one with market power are discussed with respect to allocative and productive efficiency.

2.1.1 Allocative efficiency

Banks contribute greatly to growth by promoting capital accumulation through the supply of credit. Two aspects are important in this regard: the quantity of credit supplied, and its efficient allocation.

The traditional industrial organization approach

The arguments for the potential benefits of competition derive largely from applying standard industrial organization (IO) economics to the banking industry (e.g., Freixas and Rochet 1997). In a perfectly competitive market, banks are profit-maximizing price-takers such that costs and prices are minimized. The greatest quantity of credit will be supplied at the lowest price. In contrast, market power exists where a bank can profitably charge a price above marginal cost. In this case, a bank may decrease the quantity of credit supplied and charge higher rates.[4]

The results of the traditional IO approach are well known. A competitive industry is characterized by a large number of small banks and the potential benefits are similar to those of competition in other industries. Competition maximizes welfare by ensuring that the greatest quantity of credit is supplied at the lowest price.[5]

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3. See Padoa-Schioppa (2001) for an overview of the changing attitudes.
4. A lower rate paid on deposits may also be a consequence.
5. Even in the traditional IO literature, there is a counterpoint: Bertrand competition can lead to a perfectly competitive outcome with only two firms.

Besanko and Thakor (1992) examine loan and deposit markets in a theoretical model where banks can differentiate themselves from competitors.[6] They find that loan rates decrease and deposit rates increase as more banks are added to the market. More recently, Guzman (2000) compares the effect on capital accumulation of an economy that has a monopoly banking system versus one that has a competitive system using a simple general-equilibrium model. He finds that monopoly power in banking tends to put downward pressure on capital accumulation. This tendency stems from several results in the model: a monopoly banking system will ration credit under conditions where a competitive system would not; where there is rationing in both systems, banks in each offer the same rate on credit, but monopoly banks may choose to offer a lower deposit rate; and, where there is no credit rationing, a monopoly bank will charge a higher interest rate on loans.[7] Both of these models support the theory that market power is detrimental to consumers and growth.

Net worth and information asymmetry

The standard IO framework treats banks like any other firm. Other theoretical approaches explicitly consider characteristics unique to the banking sector and argue that market power need not necessarily have a negative impact on allocative efficiency.

The quantity of capital a bank supplies is based not only on the competitive structure of the market, but also on internal factors such as net worth. The financial accelerator literature describes a bank lending channel where changes to a bank's net worth affect its supply of credit. Negative shocks to a bank's net worth lead to a decrease in lending, which has a dampening effect on growth (e.g., Bernanke, Gertler, and Gilchrist 1996). A bank's financial structure and the quality of its loan portfolio can also be important. Banks finance lending with liabilities (such as deposits) and equity. They are also subject to capital requirements that set a minimum allowable capital-to-asset ratio, which takes account of the riskiness of assets. If a bank's capital-to-asset ratio falls too low, it has two choices. First, it can increase its capital by either issuing new equity or by decreasing dividends. The former is costly and the latter can have negative effects on the bank's share price. The second choice is to decrease its assets; that is, decrease lending.

Shocks to a bank's equity (that is, net worth) can therefore affect its lending decisions, even where the capital requirement is not binding. If a bank projects that it may hit the minimum required

6. Differentiation is accomplished through a spatial model where a bank distinguishes itself based on location. This can be interpreted more broadly as differentiation on product offerings, etc. This and similar approaches are based on the spatial models of Hotelling (1929) and Salop (1979).
7. See also Smith (1998) for another general-equilibrium model that shows how competition in banking increases growth.

capital, or if it chooses to maintain a higher ratio for other reasons (for example, as a signal of quality or as a buffer for future shocks), it may decrease lending overall, or allocate a higher proportion of loans to less-risky projects.[8] Thus, for a given level of demand, a more profitable bank can supply more credit and its lending behaviour is more likely to be resilient to shocks to its balance sheet.

Capital accumulation depends not only on the volume of credit but on the efficiency of its allocation: that is, the extent to which credit is provided to the most productive projects first. The idea that banks can improve the efficiency of capital allocation is based on the premise that banks not only intermediate savings and investment but that they also produce information that mitigates information asymmetry between lenders and borrowers. Two theoretical approaches in this area focus on the role of relationship lending and of screening.

Banks engage in both relationship and transactional lending. Relationship lending involves the development of sector-specific expertise and ongoing relationships with individual firms. This is costly for the bank, but it can also profit from proprietary information gleaned through the relationship. Credit is offered based on the future profit stream of the firm, not just on the net present value of the initial project. Transactional lending involves "arms-length" lending based on readily observable information about the firm, rather than on established relationships.[9] Relationship lending is generally considered to be most advantageous to opaque borrowers; this includes young firms that have little credit history or collateral, and privately owned firms. Transparent, high-quality borrowers can more credibly signal their quality and so can choose between relationship and transactional loans.

In a seminal paper, Petersen and Rajan (1995) argue that a bank that has market power is more willing to engage in relationship lending, with the result that the supply of credit available to young firms is higher (and the cost of such funds is lower) than in a traditionally competitive environment. Banks face a pool of risky borrowers; young firms are particularly risky, since they have little credit history. In a competitive market, banks adjust for this risk by charging a higher interest rate. But this attracts a riskier pool of applicants (adverse selection) and borrowers have an incentive to take on riskier projects (moral hazard). If a bank has market power, the higher risk can be compensated for by sharing in the future profit streams of the firm, instead of by increasing rates. Because a successful firm will not be "lured away" by a competitor, the bank will benefit by

8. Capital requirements take into account the riskiness of the asset (the loan), such that more risky loans have higher capital requirements. Therefore, if a bank wants to increase its capital-to-asset ratio, it may shift lending into lower-risk loans, such as mortgages, and away from higher-risk loans, such as business lending.

9. Lending based on credit-scoring models would be one example.

lending to the firm again in the future. Therefore, the bank is more willing to offer credit, and at a "subsidized" rate, to establish the lending relationship. Credit availability, and growth, can thereby improve in banking markets that exhibit market power.

Although the negative link between competition and relationship lending is prevalent in the theoretical literature, there are opposing views.[10] For example, Boot and Thakor (2000) present a model in which banks can engage in both relationship and transactional lending. They argue that banks may actually do more relationship lending in a competitive environment.[11] Consider a monopoly bank that offers both types of loans. Relationship loans are offered to low- and medium-quality borrowers.[12] Since relationship loans have a high value for such borrowers, the monopoly bank can capture part (or all) of this value. High-quality borrowers, however, place less value on the relationship, and so it is not worth the added cost to the bank to invest in it. These borrowers are offered transactional loans. When bank competition increases, the surplus value that any one bank can extract from relationship loans decreases. This encourages the bank to decrease its investment in such lending, consistent with Petersen and Rajan. The authors, however, show that competition will decrease the bank's profits in transactional lending more than its relationship-lending profits. This encourages the bank to shift towards relationship lending.[13]

Another way to mitigate information asymmetry is through screening. Cetorelli and Peretto (2000) develop a general-equilibrium model of capital accumulation to examine the optimal competitive structure, given this screening role. Banks have an incentive to screen borrowers in order to differentiate between high- and low-quality borrowers. But screening is costly and, to the extent that rival banks can observe the results of the screening process (that is, was the borrower offered a loan?), there is a free-rider problem that decreases a bank's incentive to screen.[14] Cetorelli and Peretto show that, to minimize the free-rider problem, the optimal strategy for banks is to screen only a segment of the borrower population, and so lend to both "safe" (screened) and "risky" (unscreened) borrowers. In this world, the number of banks can have opposite effects on

10. Petersen and Rajan themselves point out that market power is just one way that banks can be induced to engage in relationship lending. Another way mentioned, for example, is for a bank to take an equity stake in the firm. This raises a variety of other issues not discussed here, such as self-dealing.
11. See Yafeh and Yosha (2001) for another model that shows how competition may be consistent with relationship lending.
12. High-quality borrowers can be interpreted as those that can credibly signal their quality; low-quality borrowers would include opaque borrowers.
13. Petersen and Rajan also investigate the effect of competition from the capital market, and find that it further decreases rents in banking, which decreases entry into the banking industry. Thus, the overall financial system is more competitive but there are fewer banks, and banks decrease relationship lending. The authors find that median- and high-quality borrowers are better off, but that low-quality, "opaque" borrowers may be either better or worse off.
14. Borrowers do not necessarily take the first loan offered, but may "shop around."

growth. As the number of banks decreases, so too does the total quantity of credit available. But there is also a greater incentive to screen borrowers, thereby increasing the proportion of "safe," high-quality loans.[15] Therefore, as the number of banks decreases, there is a trade-off between the quantity of credit offered and the quality of borrowers (that is, the efficiency of capital allocation). This trade-off is important for economic growth. Cetorelli and Peretto show that, in this framework, an oligopoly structure, not a perfectly competitive one, maximizes growth.[16]

Empirical results

The theories presented have opposite implications for credit and growth. Under the traditional IO framework, market power (the ability to profitably price above marginal cost) leads to higher loan rates and lower credit supply, which puts downward pressure on growth. In the second set of theories, market power can improve the information production function of banks (through relationship lending and screening), which improves the efficient allocation of capital.

In testing these theories, the empirical literature primarily uses the number of banks or the degree of concentration in the banking sector as a proxy for market power. The majority of the early literature uses U.S. data to examine the relationship between bank profitability (or prices) and concentration. For example, Berger and Hannan (1989) show that concentration is associated with lower deposit rates and Hannan (1991) finds that an increase in concentration is associated with higher loan rates. Indeed, early studies often find a positive relationship between concentration and profits, which supports the assertion that market power is detrimental.

A major problem with most of these studies is that they do not take into account differences in productive efficiency. A highly efficient bank may have higher profits because it is better at maximizing returns. Its success can increase concentration, since it may naturally gain a larger share of the market, and/or use its success as a platform from which to take over less successful banks. Concentration may therefore be associated with higher bank profits, without necessarily having the negative impact on credit supply predicted by the market power theories. Subsequent authors attempt to address this issue. For example, after controlling for differences in efficiency, Berger (1995) presents mixed results. Although he finds that market share is positively related to profitability when efficiency is controlled for, concentration in the banking market is usually negatively related to profit. A similar study on the European banking sector, by Punt and Van

15. In Guzman (2000), monopolies screen because they charge higher rates and therefore need to mitigate moral-hazard effects. In this paper, banks in more concentrated markets have an incentive to screen because they can profit from "proprietary" information, not necessarily because they charge more.
16. Screening is also relevant to bank risk and is discussed further below. For more on screening, see Dell'Ariccia (2000), who also shows that, as the number of banks increases, the incentive to screen decreases. Also see Cao and Shi (2000) and Manove, Padillo, and Pagano (2000).

Rooij (2001), also has mixed results. While they find some support for a positive relationship between concentration and profitability, their results are not robust to different specifications of profitability.

Petersen and Rajan (1995) use U.S. data to test their relationship-lending theory. Using concentration as an indication of market power, they find that young firms receive more credit in concentrated markets than do similar firms in less-concentrated banking markets; they also find that creditors in concentrated markets seem to smooth interest rates over the life cycle of the firm, charging lower rates when the firm is young, and higher rates when the firm is mature.

Recent work uses panel data to examine the effects of concentration within the broader financial system. Cetorelli and Gambera (2001) use a cross-country, cross-industry dataset to test the average effect of bank concentration on growth in different industries. They find that concentration has an overall negative effect on growth, but that the effect is heterogeneous across firms. Industries where young firms are more dependent on external (e.g., bank) finance grow faster in countries that have a more concentrated banking sector (which supports the concept of relationship lending).[17]

Corvoisier and Gropp (2002) use a European dataset to examine the relationship between concentration and loan pricing while controlling for competitive conditions, cost structures, and risk. Noting that different banking products may be affected differently by concentration, they develop separate concentration and price measures for each of four products: loan, demand, savings, and time deposits. They find that increased concentration is associated with less-competitive prices in the loan and demand deposit markets, but not for the other products. Different product markets may be affected differently by concentration.

Beck, Demirgüç-Kunt, and Maksimovic (2003) use a dataset of developed and developing countries to examine the effects of concentration on credit availability while controlling for regulatory policies such as entry, ownership structure, and restrictions on bank activities. They find that firms face higher financing obstacles in concentrated banking markets. The negative effect, however, is mitigated by efficient legal systems, less corruption, high levels of financial and economic development, and the presence of foreign banks. In fact, the effect is insignificant for countries that have a well-developed financial system.[18]

17. There is a growing literature on the relationship between the structure of the banking market and the structure of the markets into which they lend. See Cetorelli (2004), for example.

18. Beck, Demirgüç-Kunt, and Maksimovic find that reducing restrictions on bank activities outside the credit and deposit business may also reverse the negative effects of concentration.

Finally, Demirgüç-Kunt, Laeven, and Levine (2003) examine the effect of concentration and various regulatory policies affecting competition on net interest margins. The regulatory policies include entry restrictions, restrictions on the activities that banks can undertake, and restrictions on opening a bank. Each of these is found to increase net interest margins. Bank concentration is also associated with higher margins, but the effects become insignificant once regulatory policies and general environmental factors (such as property rights) are controlled for.

The empirical literature that links concentration to higher profits is not convincing. Early studies do find that concentration is positively related to profits, but the results are not robust across time, products, or specification of profits. As well, recent work suggests that controlling for factors such as differences in efficiency across banks and differences in the competitive environment (such as barriers to entry) can mitigate (and even eliminate) the positive relationship between concentration and profits.

2.1.2 Productive efficiency

Productive efficiency (or cost efficiency) is obtained when outputs are produced at minimum cost.[19] In the traditional IO framework, this is achieved through perfect competition. Perfect competition, however, assumes that there are no economies of scale. While the size of scale economies in banking is debatable, they are generally thought to exist to some degree. To the extent that sectors that exhibit market power tend to have fewer but larger firms, if there are economies of scale in banking, then efficiency gains may offset the more traditional negative effect of market power on efficiency.

If there are no economies of scale in banking, then one would expect a perfectly competitive market to maximize productive efficiency. If there are economies of scale, one would expect productive efficiency to improve with larger banks and more industry concentration, which (in the traditional IO framework) is consistent with an industry that has market power.[20]

Empirical results

Early studies on the ability of banks to realize economies of scale focus on the U.S. banking sector. A common finding of these studies is that medium-sized banks are the most scale-

19. The efficiency literature also addresses revenue and risk-return efficiency. The focus here, however, is on cost efficiency.

20. As will be discussed later, it is not necessarily the case that large concentrated industries exhibit market power. Therefore, it may be possible for production efficiency to benefit from both competition and size.

efficient,[21] which they take to imply that there are few economies of scale for large banks. Studies on more recent data, however, do find economies of scale for large banks when changes in the risk-taking behaviour of banks are controlled for (Hughes, Mester, and Moon 2001).[22]

Another line of literature attempts to measure efficiency directly. One widely used method is the X-efficiency approach, which attempts to capture the efficiency of a bank (given its inputs, outputs, and prices) relative to other banks. An industry-wide "best-practice" cost frontier is calculated and an individual bank's efficiency (or lack thereof) is based on its distance from the frontier.[23] The distance is called the bank's "X-efficiency."

X-efficiency studies of the banking sector typically find that there are large cost inefficiencies. A common finding is that, on average, there are cost inefficiencies in the order of 20 per cent. That is, on average, banks are only 80 per cent as cost-efficient as the "best-practice bank."[24] Some studies have attempted to identify characteristics that explain the differences in efficiency across banks; for example, bank size, organizational form, market characteristics (such as concentration), and bank-specific variables such as bank age and loan-to-asset ratios. The results are mixed.[25]

There is some evidence that competitive behaviour specifically is associated with higher efficiency. Angelini and Cetorelli (2000) provide evidence that the Italian banking industry became more competitive after regulatory reforms in 1993, whereas Schure and Wagenvoort (1999) find an improvement in the X-efficiency of the Italian banking sector after 1993. Evanoff and Ors (2002) find that an improvement in competition (measured as an increase in entry or the creation of a more viable competitor) is associated with higher X-efficiency in the U.S. banking sector.[26]

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21. The predominant finding is that the average cost curve has a relatively flat U-shape. The most efficient size—the minimum point on the average cost curve—differs depending on the study, but medium-sized banks (US$100 million to US$10 billion) are typically found to be the most scale-efficient (see Berger and Humphrey 1991, and Berger, Demsetz, and Strahan 1999, for a review of the literature).
22. Berger and Mester (1997) examine U.S. data for the 1990s and find that there is potential for cost scale economies for banks of up to US$10 billion to US$25 billion in assets. See Berger (1998) for a review of the literature.
23. Depending on the type of efficiency under review, a profit or risk-return frontier may also be constructed.
24. The 80 per cent figure is typical of studies done using U.S. data for the 1980s. Profit inefficiencies are worse, sometimes half of the best practice. Data from the 1990s tend to show higher cost efficiencies, but the overall pattern is similar.
25. Results in the X-efficiency literature are strongly influenced by the dataset, and by the empirical technique used. See Berger and Mester (1997) for a review of the literature.
26. The creation of a more viable competitor could occur, for instance, through a bank merger that results in productive efficiencies.

Overall, the most widely held result is that there are efficiencies to be gained in banking. Whether the current inefficiencies are due to a lack of competition in the market or to unrealized scale economies (or both) remains unclear.

2.2 Financial stability

There has long been a view that market power is necessary to ensure stability in banking. Banks that are profitable and well-capitalized are best positioned to withstand shocks to their balance sheet. Hence banks with market power, and the resulting profits, are considered to be more stable.

The probability of a bank receiving a shock will depend in part on its risk-taking behaviour. The literature on classic financial structure maintains that highly leveraged firms have an incentive to engage in risky behaviour. If the gamble works, shareholders benefit; if it does not work, the lenders bear the cost (Jensen and Meckling 1976). This agency problem is particularly strong for banks, since they tend to be very highly leveraged. Many of the debt-holders are depositors who are small, widely dispersed, and tend not to be well-informed of a bank's activities and potential risks; the existence of deposit insurance further lessens depositors' incentives to monitor the risk-taking behaviour of the bank.

Large banks with market power have typically been viewed as having incentives that minimize their risk-taking behaviour (the charter-value arguments) and improve the quality of their assets (the screening theories). As seen in the efficiency literature, however, the issue is not that straightforward.

2.2.1 Charter value

In a seminal paper, Keeley (1990) argues that the rise in bank failures in the United States during the 1980s was due in part to an increase in competition in the banking industry. The key to his argument is the association between charter value and risk-taking behaviour. Charter value is the benefit that accrues to a bank's owners from its future operations, and it represents the opportunity cost of going bankrupt. In determining its risk-taking behaviour, a bank must balance the gains from increased risk-taking with the loss of charter value if it fails. Keeley argues that banks with market power have higher rents and therefore higher charter values. This provides a higher

opportunity cost of bankruptcy, which deters risk-taking behaviour.[27] An increase in competition then leads to a decline in charter value, with an associated increase in risk-taking.[28] Various authors have expanded the literature, modelling different factors that affect charter value. In Besanko and Thakor (1993), the value comes from the proprietary information gained from relationship lending in a consolidated market. In Perotti and Suarez (2002), charter value is enhanced when regulators have a policy of promoting the takeover of failed banks by solvent ones, which leads to larger rents for incumbents. Any factor that increases the opportunity cost of going bankrupt would be consistent with the charter value theory.

Hellman, Murdock, and Stiglitz (2000) examine charter value in an environment that has capital regulation. Capital requirements put conflicting pressures on risk-taking incentives. Higher capital requirements decrease the incentive to take on risk by increasing the loss to shareholders if the bank defaults (the "capital-at-risk" effect). But higher capital requirements also decrease charter value, which puts upward pressure on risk-taking incentives (the "charter value" effect). Using a dynamic model where banks compete for deposits, Hellman, Murdock, and Stiglitz find that, as long as deposit rates are freely determined, banks in competitive markets have an incentive to increase their deposit rates to expand their deposit base (a "market-stealing" effect). This erodes profits, decreases charter value, and promotes risk-taking behaviour. Repullo (2003) expands on this model by explicitly modelling competition in the deposit market. Banks can invest in either a "gambling" or a "prudent" asset. Repullo shows that, without capital requirements, only a gambling equilibrium exists in very competitive and very monopolistic markets.[29] For a median market, either a gambling or a prudent risk-taking equilibrium exists.That is, competitive structure can make a difference. However, Repullo then demonstrates that, in an environment with capital requirements, the "prudent" equilibrium always prevails.[30]

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27. A counter-argument involves the idea of "too big to fail." For most banks, a share of their liabilities is protected by some form of insurance (deposit insurance), which encourages risk-taking by providing a subsidy to the bank. If the risky gamble does not win, the debt-holders and shareholders lose only the uninsured portion. However, because bank failures can have large macroeconomic consequences, and because large banks are considered to have potentially systemic consequences, there may be a belief that regulators will not allow a very large bank to fail. This, in essence, provides complete protection of the bank's liabilities. Therefore, believing that regulators will not allow it to fail (or will completely cover losses to avoid a systemic crisis), the bank may have an incentive to take greater risks.
28. Keeley uses a two-period state preference model. A key factor is the presence of deposit insurance. Later models show that, although deposit insurance may exacerbate the problem, charter value itself can explain the behaviour (e.g., Allen and Gale 2000a).
29. The degree of competition in the market is characterized by the size of the intermediation margins.
30. Both flat and risk-based capital requirements achieve this result, but the latter are more welfare-enhancing. Under a flat capital requirement, the additional capital cost to the bank is passed through to the depositors in the form of lower deposit rates. In a very competitive market, the minimum capital requirement to ensure the prudent equilibrium results may be such that depositors receive very low, or even negative, rates. The lower capital costs under the risk-based system mitigate this negative effect on depositors.

2.2.2 Screening and monitoring

In section 2.1.1, the effect of screening on allocative efficiency was discussed. A corollary is that screening can improve the quality of a bank's loan portfolio, and banks with market power may have a greater incentive to screen loans.

Even if the incentive to screen does not change with a larger number of banks, as long as the screening technology is imperfect, more banks can lead to an overall deterioration of the loan portfolios. Simply put, the least-risky borrowers are approved by the first bank they approach. Banks therefore compete to be the first to offer credit, but they might be winning the right to fund a lemon. This effect, called the "winner's curse," is exacerbated when borrowers that are rejected by one bank can reapply to other banks.

Shaffer (1998) describes a market where banks lend only to those borrowers that its screening technology designates as "good," although each bank's technology is imperfect. Borrowers rejected by a bank can reapply to each of the other banks in the market, but the banks do not know whether a borrower has already been rejected.[31] When there is a fixed pool of borrowers where the probability of being seen as a good borrower when true is greater than being seen as a good borrower when false, each successive pool of rejected applicants has a higher proportion of bad borrowers.[32]

Shaffer shows that, in this world, the number of loans made increases as the number of banks increases. The more banks there are, the less chance there is that any given borrower (including "bad" ones) will not get a loan. Therefore, expected loan losses are also an increasing function of the number of banks. Of course, many things can mitigate this effect, such as access to credit bureaus, where a bank can see whether a borrower has been rejected by other banks.

These types of theories are consistent with the idea that a higher number of banks may lead the quality of a bank's lending portfolio to deteriorate through a higher number of low-quality loans. Regulation may be useful in mitigating this tendency. Cordella and Yeyati (2002) investigate the effect of competition on banks' incentive to monitor, which determines the riskiness of their portfolio. Consistent with previous studies, Cordella and Yeyati first show that competition (modelled as an increase in the number of banks) leads to a lower investment in monitoring by the banks. This effect can be mitigated, however, when banks disclose information on the riskiness of

31. If the banks did know, this information could be added to information already available, thereby improving their screening technology.
32. This helps explain behaviour such as banks actively soliciting borrowers. By obtaining the application of a borrower first, the bank has the first opportunity to accept "good" borrowers (subject to its screening).

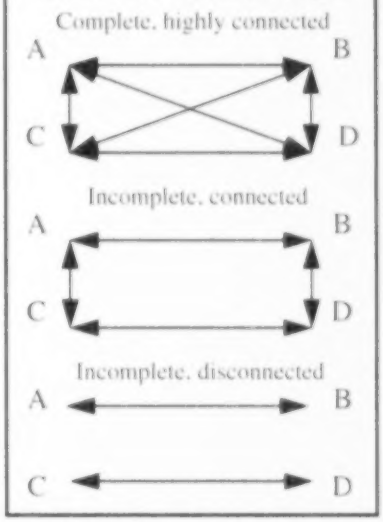
their portfolio. Disclosure increases the cost to the banks of an increase in their portfolio risk. Therefore, banks have an added incentive to manage that risk through monitoring. Two types of disclosure are considered. Public disclosure to informed depositors increases monitoring incentives, since an increase in portfolio risk will cause depositors to demand a higher deposit rate (or to penalize the bank some other way), which increases a bank's costs. Risk-based deposit insurance works in a similar way, since any increase in risk will cause the bank to pay a higher deposit insurance premium. Cordella and Yeyati show that both public disclosure and risk-based deposit insurance can mitigate the negative effect of competition on risk.

2.2.3 Contagion

If a bank fails, an important concern is whether the financial system is resilient to the shock. Contagion is defined in this context as the risk that a credit or liquidity shock to one financial system participant leads to substantial shocks to other participants. One way for this to occur is through direct linkages between participants that arise from a network of explicit (although perhaps hard-to-measure) interbank networks.[33] Three examples of such networks are the interbank markets (short-term and medium-long term), payments systems, and derivatives. The way in which banks are connected can affect the system's resilience to a shock.

Allen and Gale (2000b) examine contagion in the context of a banking system that has regional banks connected by interbank deposits.[34] Liquidity shocks in one region can spread to other regions through this network of deposits. The extent of contagion depends on the structure of interbank connections. A "complete" market structure is one where each bank has a symmetric link with each of the other banks. An "incomplete" market structure is one where each bank has a link only to those banks in adjacent regions. Another factor is the "connectedness" of the economy, which refers to the extent to which regions or segments of the economy are joined (Box 1). Allen and Gale demonstrate that:

Box 1: Interbank linkages



- In a complete market, the effect of a shock is spread among all other banks, lowering the cost of the shock to any one region. Although contagion can occur, it is less likely than under an incomplete market. Furthermore, as the number of banks

33. Contagion can also arise from indirect linkages, such as where banks have similar exposures, so that a single shock can affect multiple banks.
34. See Freixas, Parigi, and Rochet (2000) for a related paper.

(regions) increases, the impact on any one bank decreases, reducing the potential for contagion.

- In an incomplete market, the impact of the shock is borne by few banks. As a result, there is a higher likelihood that the banks will not be able to absorb the shock, and so the shock will continue to spread. Incomplete market structures are more susceptible to contagion. As the number of banks (regions) increases, the effect is opposite to that under complete markets. As the shock spreads to adjacent regions, the spillover effects increase, making it easier for the contagion to gain momentum and continue spreading.
- The combination of an incomplete and highly connected market structure poses the highest possibility for contagion.

Overall, it is not clear what effect the competitive structure of a banking system has on the pattern of interbank linkages. A larger number of banks can decrease the risk of contagion, but only when the linkages remain complete and connected. A more consolidated system with fewer banks may be more likely to maintain such linkages.[35]

2.2.4 Empirical evidence

Are banks in a competitive market more risky? In his 1990 study on U.S. bank holding companies, Keeley hypothesizes that the banking failures in the United States during the 1980s were partly due to an increase in competition that eroded monopoly rents and hence charter value. The decrease in charter value increased the incentive to take on risk. Supporting this idea, Keeley finds that charter values were positively related to banks' capital, and negatively related to bank risk (reflected in the risk premiums that banks had to pay).[36] Demsetz, Saidenberg, and Strahan (1996), building on Keeley, also find that higher charter values are associated with higher capital holdings and lower levels of risk.[37] Salas and Saurina (2003), when they apply a similar methodology to data on the Spanish banking system, find that higher charter values are associated with lower levels of credit risk.

De Nicolo (2000) examines the relationship between charter value and bank size. To the extent that larger banks are more likely to be able to exert market power, charter value and size should be positively correlated. De Nicolo, however, finds that an increase in size is associated with lower charter value and higher insolvency risk.[38] Thus, while still consistent with the idea that higher

35. Again, a consolidated system may not necessarily mean non-competitive behaviour.
36. Charter value is measured by Tobin's Q, which is defined as the ratio of the market value of the bank to its replacement costs. Risk premium is reflected in certificate-of-deposit rates.
37. Demsetz, Saidenberg, and Strahan test a variety of different measures of portfolio risk.
38. Insolvency risk is a Z-score type measure.

charter values provide an incentive to behave prudently and therefore lead to lower insolvency risk, it may be that size or market power is not necessary to accomplish this.[39]

Addressing the issue of contagion, Beck, Demirgüç-Kunt, and Levine (2003) use panel data on 79 countries over the 1980–97 period. They find that banking crises are *less* likely in more concentrated banking systems; in more competitive banking systems, which are indicated by few regulatory restrictions on entry and activities; and in countries with better-developed legal systems.[40] That is, both concentration and competition increase stability. The authors attempt to reconcile this finding by testing whether concentration is a proxy for better diversification or easier monitoring by supervisors, but the results are not conclusive.

2.3 Summary of the efficiency–stability debate

The traditional view of the trade-off between efficiency and stability is that competition improves efficiency (and thereby growth), but that market power is necessary for stability. As the foregoing review of the literature shows, however, the issue is not that straightforward.

There is no consensus in the theoretical literature as to whether perfect competition or market power best promotes allocative efficiency:

- In the traditional IO approach, perfect competition maximizes the quantity of credit available at the lowest price, and market power (the ability to profitably price above marginal cost) leads to a decrease in the quantity supplied and higher prices.
- Where there is asymmetric information, market power can increase a bank's incentive to engage in relationship lending, which benefits opaque borrowers such as young firms that have no credit history or little collateral.
- By directing credit to higher-quality projects first, screening can improve allocative efficiency. The incentive to screen falls as the number of banks rises.

39. Another issue that is often debated on consolidation in the financial sector is that larger banks may be better able to benefit from diversification. Basic portfolio theory describes how combining negatively correlated risks can decrease the risk of the overall portfolio. It is not clear, however, that diversification necessarily leads to lower risk. Instead of decreasing its overall level of risk, a bank may choose to benefit from diversification by maintaining its pre-consolidation level of return by taking on more risk. Therefore, while diversification may improve a bank's risk-return trade-off, this does not necessarily mean that the bank will choose strategies that decrease its risk of insolvency. The empirical evidence on the effects of diversification on overall risk are mixed. See Craig and Santos (1997), Hughes et al. (1999), and Archarya, Hasan, and Saunders (2002).

40. A banking crisis is defined as an episode where significant segments of the banking sector become insolvent or illiquid.

The empirical literature largely focuses on the relationship between concentration (as a proxy for market power) and profits. In some studies, concentration is indeed associated with higher profits. There is evidence, however, that the negative effects may be mitigated (or eliminated) by a well-developed financial system and by policies that increase competition, such as low barriers to entry and few restrictions on bank activities.

Very little empirical work has been done on the relationship-lending and screening theories. Whereas there is some evidence that opaque borrowers benefit from a banking sector that exhibits some degree of market power, it is not clear that such a sector improves allocative efficiency across all firms, and hence growth in the overall economy.

In general, it appears that a competitive environment is useful in promoting allocative efficiency, although the concentration of banks in the market may not be a good indicator of a competitive environment. As well, a banking sector that exhibits some degree of market power may improve credit availability to certain firms, and it may promote more efficient allocation by providing incentives to screen loans.

Productive efficiency, according to the traditional IO framework, is maximized by perfect competition. To the extent that there are economies of scale in banking, however, efficiency may be improved by fewer, but larger, banks. The empirical evidence suggests that there are currently productive inefficiencies in banking, but whether this is caused by a lack of competition or by unrealized scale economies is unclear. As the studies discussed with respect to allocative efficiency suggest, it may be that a market can exhibit both competitive behaviour and concentration. If that is the case, it may be possible to benefit from both competition and economies of scale.

Is market power necessary for stability? The charter value argument is that a higher charter value decreases a bank's incentive to take on risk by increasing the opportunity cost of going bankrupt. Market power has traditionally been associated with higher charter values, but any factor that increases the opportunity cost of bankruptcy would be consistent with the theory. As well, regulatory capital requirements may be useful in mitigating risk-taking behaviour, regardless of the competitive structure of the market.

The theoretical literature on screening suggests a similar conclusion. A banking sector that exhibits market power may have a higher incentive to screen loans, which improves the quality of banks' loan portfolios. However, policies that promote transparent disclosure of the riskiness of bank portfolios and/or risk-based deposit insurance can increase the incentive to screen even in a competitive environment.

Therefore, while market power may provide incentives to behave prudently, regulatory policies such as capital requirements, disclosure rules, and risk-based deposit insurance may provide incentives for banks to behave prudently even in a competitive market. Indeed, this is consistent with a recent study that finds that banking crises are less likely in more competitive and more concentrated banking systems.

There is no consensus in the literature as to which competitive structure optimizes both efficiency and stability. Competition is important for efficiency, but market power may also provide some benefits. Market power provides incentives for banks to behave prudently, but regulation can help ensure that banks behave prudently even in a competitive market. Neither competitive extreme (perfect competition nor monopoly) is likely ideal or even possible. Perfect competition may be even less possible in banking than in other industries. The standard IO assumptions certainly do not seem to apply: small economies of scale relative to the size of the market, homogeneous products, perfect information, and free entry and exit (characterized as zero sunk costs). Therefore, it may not be possible to completely eliminate market power in banking.

As a result, the goal may not be to eliminate market power, but to facilitate an environment that promotes competitive behaviour. In this way, the potential costs of market power are mitigated while perhaps realizing some benefits from residual market power.

3. What Does a Competitive Banking Industry Look Like?

What does an industry where banks are engaged in competitive behaviour look like? The idea has already been alluded to that the traditional IO definition of many small banks may not be the most useful or appropriate characterization of such an industry.

In this section, different approaches to assessing the competitive conduct of banks are discussed, along with characteristics of the banking sector that can influence such behaviour.

3.1 Concentration

The traditional approach to competition has been to associate more firms with more price competition and fewer firms with less-competitive behaviour. This comes from a classic IO argument, called the structure-conduct-performance (SCP) paradigm, that assumes there is a causal relationship running from the structure of the market (e.g., firm concentration) to the firm's pricing behaviour to the firm's profits and degree of market power. That is, a higher number of firms causes firms to price competitively, which minimizes the degree of market power that any one firm can exert.

Since pricing behaviour is not easily observable, the emphasis in the literature is on establishing a relationship between the structure of the market and market power. Typical structure variables include measures of concentration and the number of sellers. Market power is measured using accounting data on profits and costs. While traditional studies using this approach are based on cross-industry data, a wide literature applies the paradigm to one particular industry over time. The theory predicts a positive relationship between concentration and profits.

There are a number of difficulties with the SCP approach.[41] Accounting data on profits may not provide an accurate measure of economic profits and market power. As well, in order to measure a structural variable such as concentration, one must define the relevant product and geographical markets. All products that are substitutes need to be included in the product market definition. This can be difficult, especially for the banking sector, which has many differentiated and substitutable products, a number of which are supplied by non-bank firms. Defining the relevant geographical market (whether it is local, regional, or national) can also be difficult.[42]

A second substantial issue is a competing hypothesis that predicts the same positive relationship between concentration and profits. Under the efficient structure (ES) hypothesis, firms that have higher productive efficiency have lower costs and therefore higher profits. These firms tend to do better and so naturally gain market share, which can lead to concentration. Therefore, concentration reflects more efficient banks, not necessarily an increase in market power.

The majority of the early studies, many of which are cited in section 2, use U.S. data to examine the relationship between bank profits and concentration. These early studies often find the expected relationship.[43] Studies that use more recent data (e.g., Berger and Hannan 1998) have mixed results. Berger (1995) attempts to distinguish between the SCP and ES hypotheses by using measures of X-efficiency. The results are not conclusive. First, concentration is usually negatively related to profits, which contradicts both theories. Higher market share is related to higher profits, however, which provides some support for the market power theory. Second, higher efficiency is related to higher profits, but the relationship between higher efficiency and higher concentration is weak. This provides limited support for the ES hypothesis.[44]

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41. See Church and Ware (2000) for a thorough critique of the traditional SCP paradigm.
42. The following subsections again address the difficulty of determining the relevant geographical market. A typical definition, used in antitrust assessments, of the geographical market is the smallest area, such that a sole supplier of the product could profitably maintain a small but significant non-transitory price increase.
43. See Weiss (1989) for a review of the early literature. Even in the early literature, the results are not conclusive. More recently, Berger, Demsetz, and Strahan (1999) provide a review.
44. A similar study by Punt and Van Rooij (2001) finds support for the ES hypothesis.

The empirical results that connect concentration and profits are inconclusive and not particularly satisfying. Shaffer (2002) offers an interesting theoretical explanation for the ambiguous relationship by combining the SCP hypothesis and the asymmetric information theories discussed in section 2.2.2, particularly the effects of screening on risk. As the number of banks in the market increases, the SCP hypothesis predicts there will be less market power, and so lending rates will fall. The screening theories, however, suggest that, as the number of banks rise, there will be less incentive to screen, which increases risk. Banks can adjust for the higher risk by charging higher rates.[45] Therefore, as the number of banks rises, there is conflicting pressure on the lending rate. Which prevails will depend on the relative strengths of the market power and asymmetric information effects.

Overall, it does not appear that concentration alone provides a particularly good indication of competitive behaviour.

3.2 Contestability

Another approach, described in the contestability literature, argues that competitive outcomes can occur in very concentrated markets, and that collusion can occur even when there are a high number of firms.[46] Characteristics of the market, such as barriers to entry and exit, can affect behaviour irrespective of the actual number of firms in the market.

Two widely used techniques to empirically measure the degree of competitive behaviour in the market, called contestability, have been developed by Bresnahan and Lau (BL) and Panzar and Rosse (PR).[47] Each technique attempts to measure the competitive conduct of banks without explicitly using information on the structure of the market. This is done by estimating deviation from competitive pricing.

In the BL model, profit-maximizing firms set marginal cost equal to their (perceived) marginal revenue to determine a product's price and the quantity they will supply. In a perfectly competitive market, the perceived marginal revenue equals the demand price (called marginal-cost pricing). Under perfect collusion (monopoly), however, the perceived marginal revenue does not equal industry demand. The test statistic, λ, calculates firms' deviations from marginal cost (competitive) pricing. If $\lambda=0$, firms behave in a perfectly competitive manner. If $\lambda=1$, firms price

45. The result is that, in a competitive market, once risk is adjusted for, loan rates are an *increasing* function of the number of banks.
46. See Baumol, Panzar, and Willing (1982), and, for a review of the literature, see Claessens and Laeven (2003).
47. See Bresnahan (1982), Lau (1982), and Panzar and Rosse (1987).

according to the industry's marginal revenue curve, which is consistent with perfect collusion. Values of λ between 1 and 0 reflect varying degrees of imperfect competition. The model is applied to aggregate industry data.

The PR model examines the relationship between a change in factor input prices and revenue earned by a specific bank. Panzar and Rosse show that, in a collusive environment, assuming profit maximization, an increase in input prices will increase marginal costs, reduce equilibrium output, and reduce total revenues. Under perfect competition, an increase in input prices increases marginal costs and marginal revenues by the same amount as the initial cost increase. An H-statistic is calculated that measures the elasticity of revenue with respect to input prices. H=1 implies perfect competition, H=0 indicates perfect collusion, and measures in-between indicate monopolistic competition, so that the magnitude of H is a measure of competitiveness. Values less than 0 are consistent with perfect collusion.[48] The PR model uses firm-level data and assumes that the market is in equilibrium. While it may not therefore be a good indicator for transitional economies, it may be a reasonable assumption for developed economies, and there are separate empirical tests to check the validity of this assumption for particular banking markets.

Empirical results

Whereas little empirical work has been done on the effects of banking concentration in Canada, there have been tests on contestability. Nathan and Neave (1989) use the PR model to test for competitiveness in the Canadian banking, trust, and mortgage industries over three years: 1982–84. For the banking industry for each of those years, the hypothesis of pure collusion is rejected. Bank revenues behaved as if earned under monopolistic competition for each of the years and perfect competition could not be ruled out for 1982. Tests for the trust and mortgage industries also reject pure collusion.

Shaffer (1993) uses data from 1965 to 1989 to test Canadian banking market contestability using the BL model. The results show that banking behaviour was consistent with perfect competition over this period. A slight, but statistically significant, increase in competition is found after 1980, at which time changes were made to the Bank Act.

More recently, Bikker and Haaf (2002) examine competitive conditions for 23 countries using the PR model.[49] For all countries, including Canada, the results are consistent with monopolistic competition. This is a typical result of the contestability literature. Table 1 shows the results for a

48. These results are based on work by Vesala (1995) as well as by Panzar and Rosse.
49. Bikker and Haaf provide a good review of the literature as well.

selection of countries for 1997. The Netherlands is the most concentrated and the most competitive, according to the measures used.

Table 1: H-Statistics for Selected Countries in 1997, Bikker and Haaf (2002)

Country	H-statistic[a]	Number of banks in the dataset	Market share of the three largest banks
Australia	0.57	31	0.57
Canada	0.62	44	0.54
The Netherlands	0.95	45	0.78
United Kingdom	0.64	186	0.34
United States	0.56	717	0.15

a. H=1 indicates perfect competition.

Bikker and Haaf attempt to formally relate competitiveness (as measured by the H-statistic) with market structure (the degree of concentration). Although they find that competitiveness is negatively related to concentration, the results are weak.

Claessens and Laeven (2003) build on this work by attempting to relate the competitiveness of a country's banking sector with structural and regulatory indicators of the financial system. They use panel data (1994–2001) to construct H-statistics for 50 countries. Consistent with Bikker and Haaf, imperfect competition describes each of the countries to varying degrees; some countries that have a large number of banks exhibit relatively low levels of competition (e.g., the United States).

Table 2: H-Statistics for Selected Countries, Claessens and Laeven (2003)

Country	H-statistic	Number of banks in dataset
Australia	0.94	26
Canada	0.83	49
The Netherlands	0.94	44
United Kingdom	0.78	106
United States	0.47	1135

Claessens and Laeven then attempt to identify factors that explain the contestability of banking sectors across countries. They regress the H-statistic on a variety of country statistics, such as the presence of foreign banks, activity restrictions on banks (to engage in security market, insurance, and real estate activities), the entry regime, market structure, competition from the non-bank sector, general macroeconomic conditions, and the overall development of a country. As one might expect, Claessens and Laeven find that contestability is positively related to foreign bank presence, less-severe entry restrictions, and few activity restrictions. In all specifications, contestability is *positively* related to concentration and *negatively* related to the number of banks, significant at the 5 and 10 per cent levels, depending on the specification.

3.3 Bank characteristics that affect contestability

The ambiguous results of the concentration approach and the results of the emerging contestability literature both suggest that the competitive behaviour of banks is not necessarily related to the number of banks in a market or to their concentration. Other factors are also at work. The importance of the role played by open entry has long been acknowledged. A credible threat of entry may induce banks to behave in a competitive manner even when there are few banks in the market. A well-developed financial system also appears to be important, perhaps because banks face competition from other financial firms and markets.[50] The finding that few restrictions on the activities that banks can undertake is important to contestability may also be related to increasing competition over the entire financial system.

The next three subsections *briefly* introduce other characteristics of the banking industry that may help explain contestability in a concentrated market.

3.3.1 Asymmetric information

The role that relationship lending plays in addressing the asymmetric information problem between banks and borrowers was discussed in section 2.1.1. While relationship lending can be beneficial to opaque borrowers, it can also be considered a barrier to entry: new banks may find it difficult to attract borrowers from their established relationships. An important element involves switching costs, which are incurred by consumers when they change banks.[51] An opaque, but good, borrower may have a difficult time signalling their creditworthiness to other lenders and so

50. Indeed, Boot and Thakor (2000) show how competition from the capital market can lead to fewer banks.

51. There are a variety of fixed costs, such as moving an account, but the costs related to asymmetric information are potentially more important.

stay with the bank with which they already have a lending relationship. This "locked-in" effect gives banks a degree of market power and provides a barrier to entry that can facilitate higher levels of concentration.

Dell'Ariccia (2001) develops a theoretical model to demonstrate how asymmetric information can affect both bank competitive conduct and market structure, such that concentrated markets can be very competitive in the presence of asymmetric information. Banks gather proprietary information about their clients through their established lending relationships. This information benefits the bank in future dealings with the client. The more proprietary information a bank has, the greater its advantage over other banks. Therefore, the larger the market share a bank attains, the better its advantage. This gives incumbents an advantage over new banks and acts as a barrier to entry (even if there are no other fixed entry costs), leading to a concentrated banking sector. However, it also provides a large incentive for incumbents to compete strongly for market share. This puts downward pressure on lending rates even in the absence of a large number of banks. In this world, incumbents engage in competitive behaviour not to deter new entrants specifically but to gain (or maintain) market share.

Where asymmetric information is not important (i.e., where borrowers can credibly convey their quality), there are conflicting pressures on lending rates. Relationship lending, and hence market share, becomes less valuable to banks, which decreases their incentive to compete and puts upward pressure on rates. It will also be easier for new lenders to enter the market and compete, however, which puts downward pressure on rates. The overall result depends on which pressure prevails.

An interesting implication of this approach is that one would expect to see market structure differ, depending on the degree of asymmetric information. Markets characterized by more opaque borrowers, such as small-business lending, would have fewer lenders, whereas sectors with more transparent borrowers, such as mortgage and wholesale markets, would have more lenders. Both, however, may enjoy competition in lending rates.

3.3.2 Branch networks

The traditional IO model of perfect competition assumes identical firms that have homogeneous products. Banks differentiate themselves in many ways, however, such as by reputation, product packages, and the extensiveness and location of their branch networks. Indeed, branches have been a particularly important way for banks to differentiate themselves in many parts of the world.

Very simplistically, a bank can compete on prices (e.g., by decreasing its lending rates) or it can compete by locating branches close to clients, taking advantage of the fact that clients place value on being close to services. Branching has traditionally been viewed as a way for banks to retain market power, because branches can appropriate some (or all) of the value clients place on location, and thereby mitigate (or avoid) price competition. Branches are also typically seen as a barrier to entry, since they involve large fixed costs. Another potential disadvantage to consumers is that competition through branching can lead to a higher-than-optimal number of branches (compared with the perfectly competitive equilibrium). Due to the fixed costs associated with branches, this increases banks' costs, which are passed on to consumers (e.g., Freixas and Rochet 1997). Other approaches, however, demonstrate how branches can be beneficial to consumers.

The outcome of the traditional IO approach that competition requires many small banks assumes a unitary banking system, which has small independent banks without branches. The inclusion of branch banking can change this result. In a seminal argument, Allen and Gale (2000a) show that a few large banks with extensive branch networks can provide a more competitive outcome than a unitary banking system in an environment with switching costs: a large branch bank has less of an incentive to exploit the "locked-in" value of clients, because it is always competing for the clients' future business in another product or location.

Another way in which branching can improve competitive conduct is by increasing the effective size of the market.[52] In Calem and Nakamura (1998), branches can decrease the degree of market power exerted in remote locations (relative to a unitary banking model) by increasing the effective size of the geographical market. Branching leads to more uniform pricing across remote and urban locations. According to Calem and Nakamura (p. 608), "branch banking tends to export competition in dense urban markets to outlying areas. Thus, branch banking tends to increase the effective size of banking markets."

In support of their theory, Calem and Nakamura find that limits on branching in the United States are associated with higher interest rate spreads. Dick (2003) examines the effect of lifting restrictions on interstate branching in the United States after the Riegle-Neal Act in 1994. Lifting the restrictions on branching was associated with both higher concentration and increased competition in lending rates. Both of these studies are consistent with the idea that branching can have pro-competitive effects in a concentrated market.

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52. This is especially relevant given the importance of appropriately defining the market when assessing concentration under the SCP paradigm discussed in section 3.1. This paradigm is still predominantly used in antitrust assessments. Therefore, it is essential to understand how branching affects the market definition.

Dick (2003) also finds that lifting the restrictions on branching led to a higher density of branch outlets and higher service costs. He attributes the latter to a higher quality of service by providing clients with more location options. These findings are consistent with the traditional arguments that branching can increase costs to consumers.

This highlights an interesting trade-off. While branches are a way for banks to retain some market power, they also benefit consumers by increasing access to services and by potentially mitigating market power in remote areas. The question is, how many branches are optimal? Too many branches pose a barrier to entry and engender a large fixed cost that may be passed on to consumers, and too few may remove the pro-competitive effect of increasing the size of the market. There is also a trade-off for banks in choosing the extensiveness of their branching networks. While there are benefits to be gained from differentiation, banks will invest in branches as a way to avoid price competition. If there is a shift towards price competition (e.g., due to competition from banks or other financial firms), the number of branches should be expected to fall. That is, there may be a trade-off between price competition and competition through branching.

3.3.3 Technology

The banking industry is an intensive user of a wide range of technologies, including information technology, telecommunications, and financial product technologies. Technological innovations can affect the incentives faced by banks and thereby affect bank behaviour and the structure of the market. A new and burgeoning literature has arisen to examine the effect of technology on banking.[53] A few of its aspects are summarized here.

Economies of scale

Technological progress has the potential to increase economies of scale in a variety of bank products and services, such as payments processing, cash management, and bank office operations. As well, technology advances may lead to the development of new products and services that have more scale economies than traditional banking products. Therefore, there is the potential for an increase in the productive efficiency of banks. At the same time, the argument that technological progress has led to more scale economies has been suggested as a driving force towards consolidation and concentration (BIS 2001). While higher-scale economies will obviously benefit larger institutions, smaller banks may also benefit by outsourcing processes that are particularly affected.

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53. See Berger (2003) and the references therein.

ATMs and remote banking

As already discussed, branches have been seen as a barrier to entry, since the development of branch networks requires large sunk costs. ATM networks provide an alternative, lower-cost way to establish a physical delivery system, thereby reducing sunk costs and barriers to entry. At the same time, because they provide a range of basic services (including deposits, account transfers, and payments), ATMs can provide many of the benefits already discussed for branches, such as increasing the geographical scope of competition.[54]

Remote banking, through the internet and over the telephone, is increasing in popularity. Available through purely electronic means, it provides an alternative to the physical delivery systems of branches and ATMs. All a client needs to access banking services is a telephone or computer: proximity to a branch is less important. Therefore, to the extent that remote banking is embraced by consumers, it decreases the value placed on being close to branches, which decreases their strategic value to banks. Consequently, a large uptake of remote banking may lead to a shift away from competition through branches towards price competition. In this way, remote banking can further decrease the barriers to entry. As well, because it is not tied to a particular location, it can further expand the geographical scope of competition. While positive for contestability, it does further complicate the concept of the "relevant" geographical market. As remote banking becomes more important, the relevant market is much more likely to be larger than the local area. Vesala (1998) presents a theoretical model in which banks have branch and ATM networks. He shows that, assuming banks do not find another way to differentiate themselves, the emergence of remote banking leads to an increase in price competition even if there is no new entry into the market.[55]

Remote banking has the potential to improve contestability by decreasing sunk costs and barriers to entry. The extent to which this occurs depends on various things, such as the market penetration of the technology and the kinds of services provided. For example, consumers still rely on ATMs and branches to access cash. Even this dependency may be falling, however, as consumers rely more and more on cashless payments and on practices such as "cash back," which allows them to obtain cash through non-bank retail outlets.[56] Remote banking is currently most relevant to the deposit market, providing an easy way for consumers to check accounts, transfer balances, and make payments. It is increasingly being used for asset management, through links with

54. In the remainder of this paper, "branches" will be used broadly to mean any physical delivery system, including ATMs.

55. The same result occurs if there is an increase in competition from non-bank firms.

56. At a retail outlet that accepts debit payments, a consumer authorizes a debit payment for an amount larger than the amount of their purchase. The difference is then given to the consumer in cash.

brokerages and lending. Remote banking may be more suited to standardized transactional lending, such as mortgages. The competitive benefits of remote banking may differ for different products.[57]

Credit-scoring models and information sharing

Advances in information processing and financial engineering have led to the proliferation of credit-scoring models. Although such models have been used for some time in consumer lending, increased attention is being paid to them (at least in the United States) for small-business lending. Both credit-scoring models and information sharing have the potential to increase contestability in lending markets, by decreasing the asymmetric information problems that banks face.

Credit-scoring models use a variety of readily available information about a borrower to calculate a "score" that estimates the borrower's expected performance in repaying the loan. The use of such models for small-business lending has the potential to increase the transparency of borrowers. This has two effects, both of which decrease the barriers to entry in lending markets: it can decrease borrowers' switching costs, and it can decrease reliance on relationship lending and increase transactional lending.[58] Therefore, where these models are used, one would expect to see an increase in the quantity of credit supplied and a decrease in lending rates. Very little empirical work has been done in this area. Berger, Frame, and Miller (2002) examine the effect of small-business credit scoring in the United States and find that it is associated with an increase in the amount of credit extended, an increase in lending rates, and an increase in bank risk (for loans under $100,000). Berger, Frame, and Miller argue that scoring models allow banks to extend more credit to "marginal" borrowers who would not otherwise receive credit. This increases the risk, which is compensated for by charging a higher price.[59]

Information-sharing through credit bureaus also increases the transparency of borrowers. Both of these effects then decrease the problems of asymmetric information and increase the importance of transactional lending over relationship lending. This decreases barriers to entry, because new lenders need to invest less in developing relationships in order to be successful. While an increase in transactional lending may be positive for contestability, there is a potential trade-off between relationship and transactional lending, as discussed in section 3.3.1. In addition, there is a

57. Corvoisier and Gropp (2001) find that Internet banking increases contestability in time-deposit markets more than in loan markets.

58. Kim, Klinger, and Vale (2001) show that switching costs in banking can be quite high, but that they decrease in markets that have more transparent borrowers.

59. This is consistent with the relationship lending versus transactional lending story discussed in section 2.1.

question as to what its effect would be on growth, since relationship lending has been seen as positive for opaque borrowers. Such technology advances, however, may increase the transparency of borrowers generally and so decrease the need for relationship lending.

Technological advances such as those described in this paper have the potential to affect economies of scale in banking, barriers to entry, and the geographical scope of the market. The end result of technological progress on concentration and contestability will depend on industry-specific factors, such as the technological innovation itself, how it is used by banks, and the rate at which the innovation diffuses through the market. When the contestability of a particular banking system is assessed, the effect of technological advances should be considered.

3.4 Summary of the concentration–contestability debate

Under the traditional SCP hypothesis, it is relatively simple to assess competitive behaviour: more concentration is associated with higher levels of market power. However, the empirical results testing the hypothesis are not conclusive. The contestability literature focuses on the competitive behaviour of banks, rather than on concentration or the number of banks. The growing consensus in this area is that contestability improves with less-severe entry restrictions, the presence of foreign banks, few restrictions on the activities that banks can perform, and well-developed financial systems, the last two of which may indicate that competition from the non-bank sector is important. Contestability is not necessarily related to concentration or the number of banks.

While it may seem counterintuitive that concentration and competition can exist together, certain characteristics of the banking sector may make this coexistence more understandable, such as the presence of asymmetric information and branches and the effect and use of new technologies. The literature is developing a better understanding of these issues.

4. Conclusion

A goal of policy-makers is to facilitate a banking system that best promotes economic efficiency and stability. The traditional perception is that there is a clear trade-off between these two goals. A review of the theoretical and empirical literature, however, suggests otherwise.

A competitive environment promotes allocative efficiency by encouraging the greatest supply of credit at the lowest price. A banking system that exhibits some degree of market power, however, may improve credit availability to certain firms, and it may provide incentives for banks to screen loans, which aids efficient allocation of resources.

Market power in a banking system may contribute to stability by providing incentives that mitigate risk-taking behaviour, and by providing incentives to screen and monitor loans, which can improve the quality of banks' portfolios. Policies such as capital requirements, disclosure rules, and risk-based deposit insurance, however, may provide incentives for banks to behave prudently even in a competitive market.

There is no consensus in the literature as to which competitive structure optimizes both efficiency and stability. There are benefits to both, and neither extreme is likely ideal. Therefore, the goal may be not to eliminate market power but to facilitate an environment that promotes competitive behaviour (contestability). In this way, the potential costs of market power are mitigated while perhaps realizing benefits from any residual market power.

What does a contestable banking sector look like? There is a growing consensus in the literature that the traditional approach of equating few banks or concentration with market power is not enough. Concentration is not in itself a sufficient indicator of competitive behaviour. Other important factors are involved, such as less-severe entry restrictions, the presence of foreign banks, few restrictions on the activities that banks can perform, well-developed financial systems, the effect of branch networks, and the effect and use of technological advancements. Because it requires an understanding of these various factors, an assessment of contestability in the banking sector can be very difficult and is likely to be specific to a particular country at a particular time. It is more complicated than it first appears to be.

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